

In The Claims:

Claims 1-57 have been cancelled. Please add the following new claims and renumber these claims.

58. (New) Functional element (10) having a longitudinal axis (14), a body section (16), a hollow piercing section (18), a ring-like contact surface (20) at the body part, which extends substantially perpendicular to the longitudinal axis (14) and radially away from the piercing section (18) and an axially extending ring groove (21) which is provided in the body section radially inside the contact surface (20), with the functional element (10) being designed for attachment to a component (22) which is of plate-like shape at least in the region of the attachment, in particular to a sheet metal part, wherein the body section (16) has a pressing surface (24) at the side remote from the piercing section and wherein ribs (26) providing security against rotation are provided which cross the ring groove (21) at least in part and wherein the free end of the piercing section is provided with a ring-like cutting edge (30), wherein a ring-like bead (32) is provided at the piercing section (18) between the ring-like contact surface (20) and the free end (28) of the piercing section (18) and wherein a ring recess (34) is provided around the piercing section between the bead (32) and the free end face (28) of the piercing section.

59. (New) Functional element in accordance with claim 1, wherein the ring-like cutting edge (30) either projects radially further outwardly than the apex (31) of the bead (32) or projects outwardly to the same extent or projects less far outwardly, the diameter of the ring-like cutting edge (30) thus being larger than, smaller than or of the same size as the maximum transverse dimension of the bead (32), i.e. as the diameter of an imaginary cylinder (106) on the surface of which the apex (31) of the bead (32) lies.

60. (New) Functional element in accordance with claim 1, wherein the ring groove (21) runs out via an at least substantially conical surface (36) into the ring-like contact surface (20).

61. (New) Functional element in accordance with any claim 1, wherein the ring-like bead (32) has an at least substantially triangular shape when seen in an axial section plane.

62. (New) Functional element in accordance with any claim 1, wherein the ring recess (34) extends radially within the ring-like bead (32).

63. (New) Functional element in accordance with claim 5, wherein the ring recess (34) is bounded by the ring-like bead (32) at the side remote from the free end face (28) of the piercing section (18).

64. (New) Functional element in accordance with claim 1, wherein the ring recess (34) is at least substantially U-shaped when seen in an axial section plane.

65. (New) Functional element in accordance with claim 6, wherein the ring recess (34) has at least substantially the shape of a semi-circle.

66. (New) Functional element in accordance with claim 7, wherein it is formed as a hollow fastener element and has a fastener section (13) provided for the reception of a bolt.

67. (New) Functional element in accordance with claim 1, wherein the body section (16) has a flange section (40), with the ring-like contact surface (20) and the axially extending ring groove (21) being provided at or in the flange section (40) at its side facing the piercing section (18).

68. (New) Functional element in accordance with claim 10, wherein the fastener section (13) has one of the following designs:

a) it is located at the side of the flange section (40) remote from the piercing section (18),

b) it is located at the side of the flange section (40) remote from the piercing section (18) and extends at least partly into the flange section (40),

c) it is located at the side of the flange section (40) remote from the piercing section (18) and extends through the total axial thickness of the flange section (40),

d) it is located at the side of the flange section (40) remote from the piercing section (18) and extends through the total axial thickness of the flange section (40) and also through a part of the axial length of the piercing section (18),

e) it is located at the side of the flange section (40) remote from the piercing section (18) and extends through the total axial thickness of the flange section (40) and also through the total axial length of the piercing section (18),

f) it is located at the side of the flange section (40) adjacent the piercing section (18) and extends through a part of the axial thickness of the flange section (40) and also through a part of the total axial length of the piercing section (18),

g) it is located at the side of the flange section (40) remote from the piercing section (18) and extends through a part of the axial thickness of the flange section (40) and also through the total axial length of the piercing section (40),

h) it is located at the side of the flange section (40) adjacent the piercing section (18) and extends only through the total axial length of the piercing section (18),

i) it is located at the side of the flange section (40) adjacent the piercing section (18) and extends only through a part of the total axial length of the piercing section (18).

69. (New) Functional element in accordance with claim 1, wherein the ring-like cutting edge (30) at the free end of the piercing section (18) forms the transition between a cylinder surface (56) at the outer side of the piercing section (18) and a ring-like end face (54) of the piercing section (18).

70. (New) Functional element in accordance with claim 12, wherein the cylinder surface (56) is a cylinder surface of a circular cylinder.

71. (New) Functional element in accordance with claim 12, wherein a ring-like discontinuity is located between the cylinder surface (56) and the U-shaped ring recess (34).

72. (New) Functional element in accordance with claim 1, wherein the ring-like cutting edge (30) at the free end of the piercing section (18) forms the transition between a conical surface tapering in the direction of the flange section at the outer side of the piercing section (18) and a ring-like end face (54) of the piercing section (18).

73. (New) Functional element in accordance with claim 15, wherein a ring-like discontinuity is located between the conical surface and the U-shaped ring recess (34).

74. (New) Functional element in accordance with claim 15, wherein the conical surface tapering in the direction of the flange section merges continuously without discontinuity into the U-shaped ring recess (34).

75. (New) Functional element in accordance with claim 1, wherein the axial length between the apex point (31) for the bead (32) and the free end face (28) of the piercing section (18) lies in the range between 1 and 4 mm.

76. (New) Functional element in accordance with claim 1, wherein the axial spacing between the apex point (31) of the bead (32) and the ring-like portion (20) of the contact surface which lies in a plane perpendicular to the longitudinal axis (14) lies in the range between 0.2 and 2 mm.

77. (New) Functional element in accordance with claim 1, wherein the radial depth of the ring recess (34) measured from the apex point (31) of the bead (32) lies in the range between 0.5 and 2 mm.

78. (New) Functional element in accordance with claim 12, wherein the axial length of the cylinder surface (56) amounts to 0.3 to 2 mm.

79. (New) Functional element in accordance with claim 15, wherein the axial length of the conical surface amounts to 0.3 to 2 mm.

80. (New) Functional element in accordance with claim 1, wherein ribs (26) providing security against rotation are provided in the ring groove (21).

81. (New) Functional element in accordance with claim 1, wherein the base surface of the ring groove (21) is provided on at least a part of its radially extent with noses (26) providing security against rotation and/or with grooves (84) providing security against rotation.

82. (New) Functional element in accordance with claim 1, wherein ribs (26) providing security against rotation are provided which bridge the peripherally extending ring groove (21).

83. (New) Functional element in accordance with claim 23, wherein ribs (26) providing security against rotation or noses providing security against rotation do not project in the axial direction beyond the ring-like section (20) of the contact surface which lies in a plane perpendicular to the longitudinal axis and are preferably set back slightly relative to the latter.

84. (New) Functional element in accordance with claim 1, wherein ribs (26) providing security against rotation are provided which extend in raised manner within the ring groove (21) in the axial direction up to the bead (32) and at least substantially have a rectangular shape with two limbs.

85. (New) Functional element in accordance with claim 27, wherein the axially extending sections (26') of the ribs (26) providing security against rotation do not project in the radial direction beyond the apex point (31) of the bead (32).

86. (New) Functional element in accordance with claim 28 in which the axially extending sections (26') of the ribs (26) are set back slightly radially with respect to the apex point (31).

87. (New) Functional element in accordance with claim 1, wherein the piercing section is formed in the region below the bead (32) in cylindrical manner without ring recess (Fig. 5).

88. (New) Functional element in accordance with claim 1, wherein the ring-like bead (32) has the form of at least one turn of a thread.

89. (New) Functional element in accordance with claim 1, wherein the bead (32) has the form of at least two sections (32', 32'') of a turn of a thread.

90. (New) Functional element in accordance with claim 1, wherein the bead (32) has the form of sections (32', 32'') of a turn of a left hand thread and of a turn of a right hand thread which are alternately arranged around the longitudinal axis (14).

91. (New) Functional element in accordance with claim 30, wherein the turn sections (32', 32'') are connected to one another and preferably form a closed ring.

92. (New) Functional element in accordance with claim 34, wherein in total four turn sections (32', 32'') are provided.

93. (New) Functional element in accordance with claim 27, wherein the axial sections (26') of the ribs (26) providing security against rotation are of different length.

94. (New) Component assembly comprising a sheet metal part (22) and at least one functional element (24) with a longitudinal axis (14), with a body section (16), a hollow piercing section (18), a ring-like contact surface (20) at the body part, which extends substantially perpendicular to the longitudinal axis (14) and radially away from the piercing section (18) and

an axially extending ring groove (21) which is provided in the body section radially inside the contact surface (20), with the functional element being designed for attachment to a component (22) which is of plate-like shape at least in the region of the attachment, in particular to a sheet metal part, wherein the body section has a pressing surface (24) at the side remote from the piercing section; wherein ribs (26) providing security against rotation are provided which cross the ring groove (21) at least in part; wherein the free end (28) of the piercing section (18) is provided with a ring-like cutting edge (30), wherein a ring-like bead (32) is provided at the piercing section (18) between the ring-like contact surface (20) and the free end (28) of the piercing section (18); wherein a ring recess (34) is provided around the piercing section between the bead (32) and the free end face (28) of the piercing section (18);

wherein material of the sheet metal part (22) contacts the contact surface (20) and at least substantially fills out the ring groove (21) and wherein the sheet metal part has a piercing in the region of the piercing section through which the piercing section (18) extends, with the bead (32) being received in a ring-like groove (90) in the marginal zone of the piercing.

95. (New) Component assembly in accordance with claim 37, wherein the sheet metal part (22) has a ring-like recess (88) around the piercing and at the side remote from the contact surface (20).

96. (New) Component assembly in accordance with claim 37, wherein the sheet metal part (22) has a ring-like projection (86) around the piercing and at the side remote from the contact surface (20), with the ring-like projection at least partly surrounding the bead (32) and wherein that a ring-like recess (90) surrounds the ring-like projection (86).

97. (New) Component assembly in accordance with claim 38, wherein the ring-like recess (90) in the sheet metal part is surrounded by a planar surface (96) which lies in a plane perpendicular to the longitudinal axis (14) of the fastener element.

98. (New) Component assembly in accordance with claim 40, wherein the body section (16) has a flange section (40) with the ring-like contact surface (20) and the axially extending ring groove (21) being provided at or in the flange section (40) at its side facing the

piercing section (18) and wherein the planar surface (96) lies at least partly opposite to the flange section (40) and to the ring-like contact surface (20).

99. (New) Component assembly in accordance with claim 37, wherein the ring groove (21) extends radially within the ring-like bead (32) or is bounded at the piercing section side by the ring-like bead (32) and wherein the sheet metal material part also fills out this region of the ring groove (21).

100. (New) Component assembly in accordance with claim 42, wherein, in the region radially within the ring-like bead (32), the ring groove (21) has at least substantially the shape of the semi-circle in an axial section plane.

101. (New) Component assembly in accordance with claim 37, wherein the ring bead (32) has an at least substantially triangular shape in an axial section plane and wherein the ring-like groove (90) has the same shape in the marginal zone of the piercing.

102. (New) Component assembly in accordance with claim 37, wherein the fastener element is formed as a hollow fastener element (10) and has a fastener section (13) provided for the reception of a bolt, said fastener section (13) being:

a) located at the side of the flange section (40) remote from the piercing section (18),

b) located at the side of the flange section (40) remote from the piercing section (18) and extending at least partly into the flange section (40),

c) located at the side of the flange section (40) remote from the piercing section (18) and extends through the total axial thickness of the flange section (40),

d) located at the side of the flange section (40) remote from the piercing section (18) and extending through the total axial thickness of the flange section (40) and also through a part of the axial length of the piercing section (18),



e) located at the side of the flange section (40) remote from the piercing section (18) and extending through the total axial thickness of the flange section (40) and also through the total axial length of the piercing section (18),

f) located at the side of the flange section (40) adjacent the piercing section (18) and extending through a part of the axial thickness of the flange section (40) and also through a part of the total axial length of the piercing section (18),

g) located at the side of the flange section (40) remote from the piercing section (18) and extending through a part of the axial thickness of the flange section (40) and also through the total axial length of the piercing section (40),

h) located at the side of the flange section (40) adjacent the piercing section (18) and extending only through the total axial length of the piercing section (18),

i) located at the side of the flange section (40) adjacent the piercing section (18) and extending only through a part of the total axial length of the piercing section (18).

103. (New) Component assembly in accordance with claim 1, wherein the ring recess (34), when considered in an axial section plane, has at least substantially the shape of a semi-circle and wherein the sheet metal material at least partly fills out the ring recess.

104. (New) Component assembly in accordance with claim 37, wherein the ribs (26) providing security against rotation extend in raised manner within the ring groove (21) in the axial direction up to the bead and have an at least substantially rectangular shape with two limbs and wherein the sheet metal material is formed around the two limbs of the ribs providing security against rotation.

105. (New) Component assembly in accordance with claim 47, wherein the axially extending sections (26') of the ribs providing security against rotation do not project in the radial direction beyond the apex (31) of the bead (32).

106. (New) Component assembly in accordance with claim 48, wherein the axially extending sections (26') of the ribs are arranged set back slightly radially relative to the apex.

107. (New) Component assembly in accordance with claim 37, wherein the axially extending sections (26') of the ribs (26) providing security against rotation do not project in the axial direction beyond the ring-like contact surface (20) or only fractionally beyond the ring-like contact surface (20).

108. (New) Component assembly in accordance with claim 37, wherein the ring-like bead (32) has the shape of at least one turn of a thread.

109. (New) Component assembly in accordance with claim 37, wherein the ring-like bead (32) has the shape of at least two sections (32', 32'') of one turn of a thread.

110. (New) Component assembly in accordance with claim 37, wherein the bead (32) has the form of sections (32', 32'') of a turn of a left hand thread and of a turn of a right hand thread which are alternately arranged around the longitudinal axis (14).

111. (New) Component assembly in accordance with claim 53, wherein the turn sections (32', 32'') are connected to one another and preferably form a closed ring.

112. (New) Component assembly in accordance with claim 54, wherein a total of four turn sections (32', 32'') are provided.

113. (New) Component assembly in accordance with claim 45, wherein the axial sections (26') of the ribs providing security against rotation are of different length.

114. (New) Method for the manufacture of a component assembly comprising a sheet metal part (22) and at least one functional element (24) with a longitudinal axis (14), with a body section (16), a hollow piercing section (18), a ring-like contact surface (20) at the body part, which extends substantially perpendicular to the longitudinal axis (14) and radially away from the piercing section (18) and an axially extending ring groove (21) which is provided in the body section radially inside the contact surface (20), with the functional element being designed for attachment to a component (22) which is of plate-like shape at least in the region of the attachment, in particular to a sheet metal part, wherein the body section has a pressing surface (24) at the side remote from the piercing section; wherein ribs (26) providing security against rotation are provided which cross the ring groove (21) at least in part; wherein the free end (28) of the piercing section (18) is provided with a ring-like cutting edge (30), wherein a ring-like bead (32) is provided at the piercing section (18) between the ring-like contact surface (20) and the free end (28) of the piercing section (18); wherein a ring recess (34) is provided around the piercing section between the bead (32) and the free end face (28) of the piercing section (18);

wherein material of the sheet metal part (22) contacts the contact surface (20) and at least substantially fills out the ring groove (21) and wherein the sheet metal part has a piercing in the region of the piercing section through which the piercing section (18) extends, with the bead (32) being received in a ring-like groove (90) in the marginal zone of the piercing, the method including the following steps:

a) the sheet metal part (22) is supported on a die button (60) which has a bore (62) having a diameter (D) which is designed to receive the ring-like cutting edge (30) of the functional element (10), with the bore (62) of the die button (60) being surrounded by a ring projection (64) which merges at the side radially remote from the bore into a surface (66) perpendicular to the longitudinal axis (68) of the bore, with the longitudinal axis (68) of the bore being at least substantially aligned with the longitudinal axis (14) of the functional element,

b) the functional element (10) is moved in the direction towards the sheet metal part (22) and the die button (60) lying beneath it and a piercing slug (80) is removed from the sheet

metal part (22) by the ring-like cutting edge (30), with the piercing slug (80) being received by the bore (62; 63) of the die button or disposed of through it,

c) at the same time as the cutting out of the piercing slug (80) or thereafter, the sheet metal material is shaped by the movement of the body part (16) towards the sheet metal part (22) and the die button (60) by means of the ring projection (64) into the ring groove (21) and around the bead (32) as well as at least partly into the ring recess (34) in order to produce a form-locked connection between the sheet metal part (22) and the functional element (10).

115. (New) Method in accordance with claim 57, wherein, on the shaping of the sheet metal material (22) by the ring projection (64), the sheet metal material is also formed around or into the features providing security against rotation, i.e. the ribs (26) providing security against rotation.

116. (New) Method in accordance with claim 57, wherein the sheet metal material (22) in the region of the functional element radially outside of a recess caused by the ring projection (62) is pressed flat by the said surface (66) of the die button which stands perpendicular to the longitudinal axis (68).

117. (New) Method in accordance with claim 57, wherein the sheet metal material (22) is shaped into a ring collar (86) surrounding the bead (32).

118. (New) Method for the manufacture by cold forming of a functional element (10), in particular of a functional element in accordance with one of the claims 1 to 33, the functional element having a longitudinal axis (14), a body section (16), a hollow piercing section (18), a ring-like contact surface (20) at the body part, which extends substantially perpendicular to the longitudinal axis (14) and radially away from the piercing section (18) and an axially extending ring groove (21) which is provided in the body section (16) radially inside the contact surface (20), wherein the body section (16) has a pressing surface (24) at the side remote from the piercing section (18) and wherein ribs (26) providing security against rotation are provided